AMRAD NEWSLETTER

Amateur Radio Research and Development Corporation

November 1982

Meeting Notice

On Monday, November 1, 1982, our speaker will be Dr. Robert Suding, WØMD. His topic will be his new computerized color and black-and-white television scan converter which is something to behold. Some vital statistics are:

Transmits and receives black-and-white, multiframe color and single-frame color SSTV.

Stores up to 8 B&W or 4 color pictures.

Two to four times the resolution of most other SSTV systems.

64 shades of grey on B&W instead of 16.

Uses low-cost B&W camera for B&W and color.

Built-in uP does switching, SSTV ops, video processing, grey-scale analysis and titling.

Six wirewrapped cards, 140 ICs, about $700 parts cost.

The meeting will be held at 7:30 P.M. at the Patrick Henry Branch Library, 101 Maple Ave East, Vienna, Virginia. Visitors will be welcome.

At that meeting, nominations for two directors and two alternates will be open. Those members outside the area or otherwise unable to attend the meeting may mail their nominations to AMRAD Nominations, 1524 Springvale Ave, McLean, VA 22101 to arrive no later than December 4, 1982. The two incumbents are directors Jeff Brennan, WB4WLW and Bill Pala, WB4NFB and alternates Richard Barth, W3HWN and David Borden, K8MMO. Elections will take place at our annual meeting on December 6.

W4RI Participates in FCC Video Taped Tutorial

At the invitation of the FCC's Office of Science and Technology, Paul Rinaldo, W4RI will present a tutorial talk on "Amateur Radio Technology" on October 25, 1982 (a date which has past by the time you read this). The talk will be on video tape, a copy of which can be obtained from the FCC, free of charge. To obtain a copy, send a blank VHS-120 cassette or U-Matic cassettes to: Audio Visual Duplicator, Consumer Assistance & Information Division, Room 258, FCC, Washington, DC 20554. A listing of previous tutorials was printed in QEX number 2, February 1982. An update will be printed in QEX in the near future.

Life Membership Application Cutoff

If you are planning to apply for a life membership, please note that no more life membership applications will be accepted after December 31, 1982. Check the form inside the back page of this newsletter for rates.

Two Members Pass 5-wpm Code Test

Big news? It is if you're deaf. Congratulations are in order for Nan Sanders and Barry Strassler for passing the test on October 14. They are now awaiting written tests.

Long-Haul Packet Test Successful

On 16 October 1982, from 16:45 UTC until 17:00 UTC, a successful long-haul packet radio demonstration QSO took place between Maryland and Texas; the stations involved were Bob Diersing, N5AHD in Corpus Christi and Tom Clark, W3IWI near Washington. The QSO took place on the 10-meter band at 28,300 kHz with both stations running fsk at a 1200-baud rate using HDLC protocol currently accepted as amateur radio standards.

This test was conducted to test the suitability of existing hardware and protocols under weak-signal and QRM conditions in anticipation of the AMSAT Phase III B satellite launch in February, 1983, and to help in the planning of future satellite missions including a possible dedicated packet radio mission a few years from now.

The demonstration QSO took place just one week after a landmark meeting held under AMSAT's auspices to establish and coordinate common packet radio protocols. This meeting in the Washington, DC area was attended by representatives of packet radio groups from San Francisco, Tucson, St. Louis, Washington and New Jersey. The meeting succeeded in reconciling minor differences that had evolved between the various groups during their R&D activities. The goal of establishing common protocols was focused on the upcoming satellite launches when it will be possible, for the first time, for the different packet radio groups to reliably interconnect local networks on a global basis.

During the long-haul test, both N5AHD and W3IWI were using VADCG Terminal Node Controller (TNC) hardware developed in Canada with software developed in Vancouver, San Francisco and Washington. They both used conventional "202A" fsk modems operating thru 100-watt ssb transceivers. A number of packets were successfully exchanged in both directions, and the TNC board's software automatically verified the accuracy of each transmission. In the test QSO, the number of retries required never exceeded three. The stations had conducted previous long-haul test experiments through the AMSAT-OSCAR-8 satellite.

W3IWI has been involved in a number of previous AMSAT demonstration tests including initial feasibility demonstrations using satellites to locate downed aircraft which led to the international Search-and-Rescue Satellite (SARSAT) program and tests of digital phase-shift-keying (psk) techniques to be employed on the Phase III satellites.

N5AHD has developed automated, real-time telemetry acquisition techniques for the UoSAT-OSCAR 9 satellite and operates AMSAT's CBBS which can be accessed at (512) 852-8194.

Both N5AHD and W3IWI have been frequent contributors of amateur radio software which is available through the AMSAT Software Exchange (ASE). Further information about AMSAT, ASE or AMSAT's CBBS can be obtained by calling the CBBS or by writing:

AMSAT, Box 27, Washington, DC 20044.

Thanks, W3IWI.

Latest Developments with the W9JD FEC ARQ System or How I spent My Summer Vacation

Jerome T. Dijak, W9JD/2
215 Tareyton Drive
Ithaca, NY 14850

I haven't written much since I completed my series of FEC ARQ articles last spring. There are several reasons for that. First, our household welcomed the simultaneous arrival of two (2) new babies on March 1st (Kathryn and Carolyn). They have been keeping use pretty much "off the streets" (as well as pretty much awake) most of the time. With the "spare time" that I have remaining (na!), I have been continuing experiments with Wally, WØPHD, and we have continued development and improvement of the ARQ system through weekly skeds and a major revision of the program this past summer.

By the way, several folks obtained the ARQ software and documentation last spring. Have any of you gotten the system up and running? Have any of you used it on the air yet? If so, I would like to hear about it. As far as I know, Wally and I are still the only ones using the system on the air.

Status of the Old Software

Wally and I excercised the "old" software (that which I was distributing last spring) up until July. After extensive testing with long QSOs (often several hours at 150 b/s) as well as repeated jamming experiences, we did discover a couple of slight bugs in the old software that occur under some conditions. These were fairly easy to fix, and if anyone is using the old software and has run across some problems, let me know, and I will tell you how to fix them.

But my recommended approach to those interested in the system is simply to use the rewritten version of the program. I did not undertake the complete review and rewrite of the software because of the few bugs (those were easily fixed with patches), but rather because after long hours of using the system, Wally and I identified an extensive list of enhancements that would greatly increase the power and convenience of the system.

Useful System Improvements Identified

As Wally and I used the system through spring and early summer, I compiled a list of all the ideas that came to either one of us regarding handly things to change about the system to either make it work better under adverse conditions, make it more convenient for the operators, or make it more efficient in terms of throughput. Below is the list of things that we came up with. (Granted that, since most of you have never used the system, the impact of these changes may not really be appreciated.)

1. We found that most of the buffers were much larger than really needed. In the interests of reducing overall memory requirements, looking toward the day when we might want to implement the system on a single intelligent interface board, I decided to cut back the buffers to about half their previous sizes.

2. We found that the process of entering the ARQ link mode was awkward and not fail-safe under adverse conditions. This especially applied to initiating and terminating machine-code file transfers. The old system sent a command byte repeatedly over the link and assumed that the receiving end got it right at least once. Under reasonably good conditions this was usually true. But under poor conditions things tended to fall apart sometimes with one end of the link thinking it was in ARQ mode while the other end thought it was still in BCST mode. So I decided that the process of changing modes from ARQ to BCST, or vice versa, would be done via an encoded block using forward error correction, and that the link would not actually change states until the initiating station received an acknowledgement back from the distant end. A similar procedure would be used for starting and ending direct machine-code file transfers. This would make mode changes very reliable.

3. I wanted the system to be able to operate in a "net" environment, where there would be more than two stations on frequency at once. We needed a capability to put just one pair of stations into ARQ mode so that they could pass their traffic while the others stood by. To do this we needed a facility where the station initiating ARQ mode would identify to the system the call sign of the other station desired. Then only this one station would respond to the ARQ command (automatically) and that specific link would be established.

4. It was suggested to me by some Canadian amateurs whom I met at the Rochester (NY) Hamfest that I could probably encode 8 ASCII characters into the 7 8-bit bytes of my data frames. After some thought about that I agreed that that would be feasible. It even turned out that the software changes required to accomplish this were fairly simple.

5. After Wally and I had done many file transfers, where the sending station needed to tell the receiving station the top address of the file as well as the overall checksum for the file, I decided that the system ought to be able to do that itself without the operators getting involved.

6. I observed that if I restricted the address range for data frames to 00 - 7FH (only 7 bits), I could also acknowledge 8 frames in each ACK block rather than just 7 as before.

7. Looking again to the time later when we might want to put the program in EPROM on a dedicated interface board, I decided that it would be nice to move all the file system software modules to a position above the rest of the program code to make it easy for someone to simply omit them to reduce memory requirements.

8. In operation, especially under adverse conditions, we noticed that you often spend a lot of time with many blocks in the receive intermediate buffer (DBUF) - but not yet displayed - while you wait for one or two very early blocks to be received successfully to fill in the early holes. I figured that this could be improved by sending the first few blocks residing in the XMIT buffer (ENCBUF) a few extra times during each transmit interval to increase their probability of being correctly received.

9. We found that it was very awkward for the sending station not to know how far behind the receiving station was in actually viewing the text being sent. As I mentioned in the previous article, there sometimes can be very long delays before some portions of the received text actually get displayed at the receiving end -- especially when blocks early in the "message" are repeatedly obliterated in the retransmissions due to very adverse conditions. Under these conditions, a lot of good data may be accumulated in DBUF, but it is held there awaiting the reception of those first few blocks before anything gets sent to the video display. We decided that it would be nice if the sending operator could be aware of this condition. (Because when this is happening, he can help

(continued on page 3)

PROTOCOL

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Agreement, at Last!

Using the Tom Clark "Lock-um all in a room" approach, in a flurry of activity on AMSAT weekend (8-10 October), the various packet radio groups (New Jersey, Washington, Saint Louis, Tucson and San Francisco) agreed on a protocol to use for ISO Level 2 on the new AMSAT Phase III-B satellite due for launch in February, 1983. The name for this protocol could be any number of things depending on where you are standing. I understand that TAPR (the Tucson group) has agreed to drop current software plans and go with this new protocol. Hank Magnuski, KA6M, who had just finished his latest protocol and brought it with him to the meeting, scrapped it and went home to write the new protocol for the Vancouver packet board. More PROM burning will be required when Hank finishes, but it will be worth it.

Two features of this new protocol are important. One feature is the address is now an amateur radio call sign instead of a number. Second, not one but two (or three) call signs may be used:

Destination Address
Source Address
Repeater Address

This allows multiple repeaters on the same radio frequency. A "repeated" bit is set when the repeater repeats someone and thus our current dumb (a relative term) repeaters can be used for extending rf domains. Complete details of the new protocol will appear in QEX.

Computer-on-Packet

I have continued with my applications programming work since my friends seem to have the protocol situation well in hand. This announces the AMRAD host computer, COP. This computer will be accessible on the AMRAD repeater 147.81/.21, using packet, whenever I am in residence. Your standard packet station should now consist of a terminal, Vancouver packet board, Bell Standard 202 modem and 2-meter fm transceiver. Connect up to K8MMO* and currently you will receive a CP/M prompt (A>). Users not familiar with CP/M can wait for my new program to get finished which will be "user friendly" (latest buzz word at work). This system was demonstrated during the AMSAT annual meeting on the AMSAT repeater 146.325/.825. It was used then to play Adventure. On Saturday, 16 October, I will demonstrate it again at the Vienna Oktoberfest on the AMRAD repeater.

The program I am working on, written in PASCAL, will send a "computer available" packet every eight minutes to tell packet users when the computer is ready for use. It will have a simple menu to allow playing chess, playing Adventure and leaving mail. The mail machine is going to be as designed by Hank Magnuski, KA6M.

Mailbox

AMRAD has had a mailbox on the repeater previously when Bob Bruninga, WB4APR was operational on RTTY. The type suggested by Hank however is different than Bob's or a normal CBBS. In this new type mailbox, you supply your call sign and a command to leave a message or retrieve any messages for you. There is no interaction, just input and output. It sounds like some program work is involved. Terry Fox, WB4JFI claims that a normal CBBS will do this if properly fed with a command string.

Data Base

We all need to be thinking about what kind of an on-line data base we would like on the COP. The easiest idea is to find what subset of AMRAD members do not mind having their name, address, call sign and computer usage broadcast about and put a membership list on-line. This would allow you to print the list and then pick out amateurs with the same computer as you have, etc. I think that is pretty dull, but maybe by thinking hard about the problem we can come up with some better data to access. Certainly a list of all packet users known would be a good start.

Calculate

Most computer hams have some sort of program that does calculations using those nasty formulas we all memorized for our license and then forgot. Perhaps the formulas concern active filter component values or satellite orbits or antenna dimensions. We could provide those kinds of programs to run. Persons writing such programs could leave them on the system in case someone else might find them interesting.

Abstract

An abstract file should be accessible which delineates what programs are available on the COP and a short piece about each.

Rf

There is only one problem with the COP that I can see, it is at my house currently. It needs to be at Terry Fox's QTH since he puts a large, consistent signal into the AMRAD repeater. Perhaps all this computer working will activate Terry to provide the finest mail service East of San Francisco.

(W9JD Developments, continued from page 2)
things out by not introducing new data into the transmit stream until most of the old blocks have been received.) So I decided that a facility was needed whereby the sending operator would view the buffer fullness at the receiving station.

Back to the Drawing Board

Many of the above desired system enhancements affected many of the fundamental operations and most of the modules of the ARQ program. As a result, it was necessary to very substantially redesign the system to incorporate all the modifications. This was done in July and August, and the resulting system is now much nicer to operate as well as running with about 14% better throughput due to sending 8 characters per block rather than 7. (Due to the block format changes, however, the old software is now obsolete and incompatible with the current program.)

General Comments

We have transferred large machine-code files on several occasions, and it seems to pretty consistently require 20 to 25 minutes to transfer a 4-kbyte file at 150 b/s (we are using 170-Hz fsk) on 20 meters under normal conditions (New York to Minnesota, 60 W output power at each end, fading,
(continued on page 4)

THE DEAF AND THE TTY

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Silver Spring, MD 20910
301-589-3006 (Voice/TTY)

TDI Letter to the FCC

I wish to share with the readers of the AMRAD Newsletter the contents of the TDI letter to the FCC Commissioner, afirming our stand on closed captioning. Here it goes:

September 27, 1982

Mr. Mark Fowler, Chairman
Federal Communications Commission
1919 M Street, NW
Washington, DC 20554

Dear Mr. Chairman:

Please permit me to introduce myself. I am the Executive Director of the Telecommunications for the Deaf, Inc (TDI), a national non-profit membership organization that oversees all telecommunication matters that relate to the deaf. We work very closely with the National Captioning Institute on Line 21 matters. In fact, I was supposed to accompany the group of deaf leaders that visited your office on September 17th. Unfortunately, I was unable to do so. The TDI, for your information, is the nation's second largest deaf-run organization.

We are especially concerned with the impending FCC decisions on proposals that would affect closed captioning on Line 21. A few years ago we were confronted with a compatibility crisis that parallels today's developments. Our 80,000 telephone TTY/TDD devices for the deaf were based on the Baudot code. We were pressed by several corners to publicly endorse the ASCII code, which would have threatened to render obsolete our existing telephone devices. Because a huge number of our deaf TTY users are in the low income category, disenfranchisement would have imposed undue financial hardships on them. Instead we pushed hard for a dual-modem TDD, as a compromise between these two codes. As a result, California has adopted this as a standard, and three manufacturers have incorporated these features into their production lines.

The Teletext/Closed Captioning issue is another example of compatibility that worries us. Being deaf myself, the Line 21 Telecaption Adapter has revolutionized our lives, and we can also vouch for many thousands of deaf households enjoying this technological advance. While we favor the Teletext, we fervently hope that should this system come into existence, their programs will be closed captioned and that it will be made compatible with our Telecaption Adapter. A special transcoder device had demonstrated this compatibility capability at the recent Videotex '82 exposition in New York. Like with the dual-modem TDD, the compatibility feature is our overriding concern. If this is not the case, then a tragedy of disenfranchised deaf Telecaption Adapter owners will unfold itself across the nation. Again as with TTY's, the $250/$300 investment in a Telecaption Adapter is a considerable expense for many of these households.

For your information, the TDI has become a distributor of Telecaption Adapters. We recently entered this venture with only one objective in mind - to keep prices so low that every interested deaf customer would be encouraged to make these purchases. To achieve this ideal, we have introduced a special financing plan to accommodate our low income customers. And this is a feature that a major retailer, that have been selling these devices, failed to extend to these low income customer. On the long run, we hope there is a Telecaption Adapter in every American deaf household.

The point is - if the deaf people want Teletext to reap the benefits of electronic information services, this it is their marketing decision. But if the deaf people prefer only closed captioned programs, the Telecaption Adapter is available for them, and they should not be forced to purchase Teletext equipment for this purpose.

We are confident that the future will usher in an increase of closed captioned programs on the air by an increasing number of television networks, including those which have declined Line 21 participation. This is the basis for the TDI stand on this issue.

We trust that your decision will be consistent with the needs and desires of the average deaf "man on the street". Thank you very much for your time in reading this letter.

Sincerely yours,
Barry Strassler
Executive Director for the Deaf, Inc

cc: Honorable Patrick J. Leahy, Senator
President John Ball, National Captioning Inst.
FCC Commissioners

If the FCC consistently adheres to their stand that the market place should decide the technical standards, tnen the deaf people might lose. There is no way that 60,000 deaf Telecaption Adapter users could compete against 80 million users of Teletext that CBS has forecast.

(WØJD Developments, continued from page 3)
and occasional jamming).

We have found that the presence of jamming (intentional or unintentional) is **by far** the single most important factor in disrupting the flow of data with this system. (Unless the jammer can be **overpowered** the channel is essentially "unavailable" while the jammer is on the air.) The forward-error-correction system allows good data throughput under most fading conditions. But long (1 second) and deep fades will also obliterate blocks occasionally. The system will run all day with very high throughput, however, on a channel with no jamming and little fading -- even down to extremely poor S/N ratios. S/N ratio seems to be the least of our worries.

What Next?

Believe it or not, there are still three things that we (Wally and I) dislike about the current system design, and these could not be corrected by changes to the software alone. My next article will discuss these concerns and how they are being attacked.

Tucson Amateur Packet Radio Activities

Den Connors KD2S and Lyle Johnson WA7GXD
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Tucson, AZ 85734

TAPR is back from a very hot summer, and we're readying for an onslaught of activity in an expanded number of Beta sites. As background, the summer found us switching the processor on our Terminal Node Controller board from a 6502 to the more powerful 6809, to allow for software protocol implementations using concurrent or multi-tasking systems. There are now three different groups working on software, with Lyle WA7GXD building up system primitives in assembler and constructing a fully-compatible VADCG LIPMO4-type protocol. This first effort for hardware testing allows us to use Lyle's Vancouver boards in both station and repeater modes.

Marc Chamberlin, WA7PXW and Dave McClain, N7AIG are finishing the FORTH dynamic-addressing experiment. Dave finished the 6809 target compiler for his Apple system, and Marc is rewriting the code he generated on the Point 4 TNC simulator to be compatible, and run on, the Apple. They hope to have this experiment on the air this fall.

Elsewhere is this newsletter you'll find a report on protocol standardization which occurred at the special AMSAT packet radio meeting held in the first week of October. TAPR was represented by Den and Lyle, and was in complete agreement on the resulting "AMSAT standard". To this end, Margaret Morrison, KV7D has embarked on an implementation, from scratch, of this protocol. Using 6809 assembler and PASCAL (UCSD standard), Margaret is targeting a fall release. The development system is a combination of DEC-10, VAX running VMS and H.P. 64000 workstations... talk about the classy way to get things done!

We are now working on a target delivery to Beta sites of TNCs next month, but we've learned to keep our mouths shut about promises and due dates. The St. Louis group (SLAPR), ably led by Pete Eaton, WB9FLW and Bill Reed, WDOETZ, have taken the task and responsibility of having the Beta schematic turned into a layout within the next three weeks, and have also found the mythical "custom transformer" that makes installation of a working TNC no more difficult than opening up the packing box and putting cables back on, installing a radio-dependent plug on the rf interface cable and trying it out. We hope Beta site coordinators will help in the integration of hardware for their areas. Final prices for complete packages will be sent to coordinators very soon; I think we're all in for a very pleasant suprise, due to some dogged arm-twisting by Lyle.

For a little more information on what Lyle and the hardware group have been doing this summer, read on...

The major problem faced in initial experiments with our Alpha TNCs was with the modem radio interface. The TNC ran well at 600 baud, but balked at 1200. Plots were made of the audio response of the entire system and then reduced by the team of Morrison and Morrison (KV7B & D). The result was a FORTRAN program to optimize the design of a switched-capacitor active filter using the National MF-10CN filter IC. After a couple of passes, a successful design was made operational, and was tested with numerous radio combinations (courtesy of WA7GXD, KD2S, KV7B, KV7D and NØADI) with favorable results.

A warning though.. beware of attempting to operate a packet station with a transceiver that has appreciable levels of second-harmonic distortion. An initial investigation indicated problems with the ICOM IC-211 and the Kenwood TR-7400A.

The CWID circuitry works well now (see the last issue of the PSR) and the transmitter keying circuitry w/ lockout worked fine for all radios tested.

A 6809 adapter manufactured by MMS, Inc. here in Tucson was sucessfully interfaced to the TNC, replacing the 6502. This modification allows the Alpha boards (made so long ago) to use the same code being developed for the Beta boards.

Although the Alpha test has given boards that work talking to each other over the air, no test protocol has yet been written to test them in a **network** configuration. So the Hardware group is temporarily playing software group as well, coming up with both the TNC interrupt drivers for all of the on-board ICs (less the parallel port, for Alpha), and sufficient assembler code to operate with Lyle's two VADCG boards, one using the AMRAD repeater protocol, and the other acting as another station on the net. This gives us both a good test of all software, and a proper test of compatibility with all of tne VADCG boards already out in the field.

Our coordination efforts within TAPR have been horrendous, with close to 180 members in over 25 states and four countries as of this writing. We have been simply inundated with requests for information, and have not only missed some of those requests, but have messed up getting information out to our own members! Although we're doing what we can to keep outsiders informed, I would urge anyone with an interest in what TAPR is doing to become a member for just one year, at $12. The President's office has just taken over handling requests, complaints etc. and will be very responsive to other people's needs.

Please send requests for information, membership requests and the like to Tucson Amateur Packet Radio at the above address.

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Radio Amateur Telecommunications Society

Gordon Beattie, N2DSY (ex-WB2CAM)
235 Walker Street
Cliffside Park, NJ 07010

RATS News

Well once again we are writing about our activities and the activities of other groups in the area. The most exciting news is the growth of interest in Packet Radio. This is largely due to the talks given by several people to area radio clubs. I cannot emphasize enough just how impressive this stuff is to the people from other groups. Local repeater groups were the primary targets and they with their allegedly "CB" type memberships were not only interested but are now actively getting involved in the effort.

The Cherryville Repeater group and the Ramapo Mountain group are really booming !! Bill Ashby, K2TKN in Cherryville has been the software and hardware sponsor/hacker of most of the state. Most people don't realize just how much he has done toward making their Vancouver TNC's work. In Oakland, the Ramapo group has grown quite nicely under the guidance of Steve Robinson, W2FPY and Bob Anderson, K2BJG. Steve and Bob have put together a few TNCs and integrated one as a packet repeater into the 220 voice machine. The guys at Bell Labs have been coming along quite nicely too! Phil Karn, KA9Q is working on a TNC and interfaces to a VAX and an S-100 system. Paul Newland, AD7I has been behind the hf packet effort in the NY/NJ area. He also has filed various requests for STAs and new rules with the FCC. His input was added to the input from AMRAD and others in formulating the new rules on codes and speeds of data transmission.

RATS has put together a packet repeater on two meters (146.535) as well as getting people involved and their stations up. We will be moving the machine to a new site up another two hundred feet. This and a new amp will give us great coverage. This machine will be operating in cooperation with municipal, county and state Civil Defense bodies. If required the machine will be available for use as a remote base on 146.535 or one of several 220 frequencies. Progress on the formulation of a national standard was made during the recent AMSAT meeting. More on this will be published soon, but we wish to encourage people to input their comments and suggestions on the protocol.

There are other pockets of activity in the area, however they and the groups mentioned above are suffering from an rf domain problem. This is being worked on by many of the groups. Cherryville is working on a link to Maryland, and RATS is looking toward Albany, New York and Hartford Connecticut. More local issues of linking the two-meter crowd with the 220 group will help to expand the rf domain. More on this later.

RATS has almost completed the hardware for its first packet switch. This will allow for intelligent routing of data in real time via virtual circuits. Eventually it will replace the present digipeater. If anyone has outstanding requests to RATS for information please rattle our cage. We have been a bit slow in filling these requests and will be improving this with the turnover of these duties to our new public relations officer.

AMRAD Amateur Radio Research and Development Corporation

Membership Application/Renewal

Mail to: Dr. William P. Pala, WB4NFB
5829 Parakeet Drive
Burke, VA 22015

See reverse for overseas mailing rates.

	Annual	Life
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☐RTTY ☐Deaf TTY
Computer model_____
Microprocessor type_____

I agree to support the purposes of the Corporation.

*Signature*_____

The Amateur Radio Research and Development Corporation (AMRAD) is a worldwide club of over 500 amateur radio and computer experimenters. It is incorporated in Virginia and is recognized by the U.S. Internal Revenue Service as a tax-exempt scientific and educational organization.

The purposes of AMRAD are to: develop skills and knowledge in radio and electronic technology; advocate design of experimental equipment and techniques; promote basic and applied research; organize technical forums and symposiums; collect and disseminate technical information; and, provide experimental repeaters.

Meetings are on the 1st Monday of each month at 7:30 P.M. at the Patrick Henry Branch Library, 101 Maple Ave E, Vienna, VA. If the first month is a holiday, an alternate date will be announced in the newsletter. Except for the annual meeting in December, meetings are normally reserved for technical talks - not business.

WD4IWG/R is an open repeater for fm voice and digital communications, especially for experimental modes. It is located at Tyson's Corner, McLean, VA. It features semi-private autopatch available to licensed members. Frequencies are: 147.81 MHz in, 147.21 MHz out. The repeater director is Jeff Brennan, WB4WLW.

WB4JFI/R is a 1200-baud half-duplex packet repeater in Falls Church, VA and may be accessed via WD4IWG/R frequencies.

WB5MMB/R is a 1200-baud simplex packet radio repeater which operates on 147.585 MHz from Vienna, VA.

The AMRAD CBBS, 703-734-1387, is operated by Terry Fox, WB4JFI. The system accepts 110, 300, 450 and 600-baud ASCII, Bell 103.

Handicapped Education Exchange, 301-593-7033, is operated by Dick Barth, W3HWN. HEX accepts 110/300-baud ASCII and Baudot deaf TTY/TDD calls.

AMRAD is affiliated with the American Radio Relay League (ARRL), Foundation for Amateur Radio (FAR), Northern Virginia Radio Council (NOVARC) and the Mid Atlantic Repeater Council (T-MARC).

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